

## **Appendix I**

### **Storm Water Analysis**

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Date: May 14, 2004  
To: 11400 South EIS – Project File  
From: Greg Davis  
Subject: **Storm Water Management**

The 11400 South EIS Study area incorporates an area bordered by 10600 South and 12600 South on the north and south ends respectively, along with 700 East and Bangerter Highway on the east and west sides of the study area. The alternatives presented in the EIS include different combinations of possible roadway improvements on the following segments of roadway:

- 10600/10400 South
- 11400 South
- 12300/12600 South
- Jordan Gateway/Lone Peak parkway
- State Street

This memo will outline storm water management issues associated with each segment of roadway listed above. The project area falls within the jurisdiction of UDOT and four other cities, South Jordan, Sandy City, Riverton City and Draper City. Guidelines for development of storm water management infrastructure have been based on UDOT design standards outlined in UDOT's Manual of Instruction and the AASHTO Model Drainage Manual, 1991. In addition, the individual Storm Drainage Master Plans for each city have been taken into consideration.

This outline will not address the specific alternatives being carried forward in 11400 South EIS but does address each element that is common among the alternatives being studied

## **10600 South / 10400 South**

The EIS assumes that the configuration 10400 South / 10600 South roadway will be five lanes within the study area. Recently UDOT completed the construction of a five-lane section from Jordan Gateway to Redwood Road. UDOT is also in the final stages of completing an EA, which will provide for the widening of 10400 South from Redwood to Bangerter Highway to a five-lane section. This study assumes that 10400 /10600 South will be five lanes within the limits of the study area. The section from I-15 to 700 East will remain 5 lanes and no adjustments to the storm drain system will be needed east of I-15.

Based on the assumptions listed above all the storm water from Bangerter Highway to Redwood Road is collected and conveyed to the Redwood Road intersection, the peak discharge at the intersection is approximately 80 cfs. The initial 43 cfs of flow is directed south down Redwood Road to West Town Drive then turns east and flows into a regional detention pond located adjacent to Beckstead Lane and outfalls into the South Jordan Canal. The remaining 37-cfs flows through an overflow structure at the intersection of Redwood Road and is routed east down 10600 / 10400 South to another detention pond located at 10600 South and 1000 East. Widening the five-lane section to seven lanes will increase the impervious area of the roadway by approximately 30% and will increase corresponding the peak flow by approximately 30% also. The seven-lane section will increase the peak flow at the intersection of Redwood road to approximately 100 cfs. The storm

drain system will continue to convey 43 cfs to the pond located near Beckstead Lane, the remaining 57-cfs will need to be conveyed to the pond located at 1000 West. The capacity of the pond at 1000 West will need to be increase by up to 30% to handle the additional flows generated between Bangerter Highway and 900 West. This pond is part of the South Jordan Master Storm Drain Master Plan and was design to handle the 100 year storm for a much larger area than the 10600 / 10400 South roadway. Further analysis will need to be conducted to evaluate if the existing storm drain system can handle the increased flows. If not, the existing system will need to be improved with a larger trunk line or a new trunk line may that would run as a parallel system to convey the additional flows to the detention pond at 1000 east. The area between 1000 West and 700 West will continue to outfall directly to the Jordan River. The outfall structure on the south side of the road will need to be relocated if the roadway is widened to the south.

### **11400 South**

All the alternatives that include improvements to 11400 South call for a five-lane section from State Street to Bangerter Highway. The roadway east of 200 East is currently at a five-lane section and no storm drain improvements are needed with this study. Currently the 11400 South roadway is typically comprised of two lanes traffic with narrow shoulders. The existing storm drain facilities are very limited and generally serve localized development along the corridor and are not capable of conveying the storm water for the proposed improvements. 11400 South from Bangerter Highway to I-15 is within South Jordan City, the drainage concepts presented are primarily based on the South Jordan Storm Drain Master Plan. Generally the terrain slopes from west to east between Bangerter Highway and the Jordan River, from the Jordan River to 700 East the terrain slopes from east to west. 11400 South Crosses 9 major canals or rivers, listed from west to east they are as follows:

- Welby Jacob Canal – Bangerter Highway
- Utah Lake Distributing Canal – 3200 West
- Utah and Salt Lake Canal – 2200 West
- South Jordan Canal – 1500 West
- Midas Creek – 1250 West
- Jordan River – 900 West
- Willow Creek – 600 West
- Jordan and Salt Lake City Canal – 400 West
- East Jordan Canal – 200 East

The canals listed above are not planned to serve as outfall locations for any of the storm water generated along 11400 South. Midas Creek runs parallel to and is located just south of 11400 South from Bangerter to 1300 West. Midas Creek is the primary outfall for storm water on 11400 South west of the Jordan River. The Jordan River will serve as the outfall for the area between Marco Polo Lane (1250 West) and 700 West. Willow Creek will service the area from 700 West to the East Jordan Canal (200 East). Willow Creek will also pick up flow from State Street and Jordan Gateway / Lone Peak Parkway between 11000 South and 11800 South and any flows developed by an interchange at 11400 South and I-15. An additional 92 cfs discharge from the East Jordan Canal is also being accounted for at the Willow Creek outfall.

Efforts have been made to incorporate elements of the South Jordan Storm Drain Master Plan. One of the ponds outlined in the South Jordan Master Plan is located at approximately 1300 West and 11500 South. Drainage along 11400 South west of 1300 West will be routed to this pond and released into Midas Creek at that point. In addition to the pond located on 1300 West another pond located at 2700 West and 11400 south will be incorporated into the proposed storm drain system primarily to reduce the peak flows entering the 1300 west pond. Ponds near the Jordan River, Willow Creek and I-15 will be also be required to address the roadway drainage to reduce the peak flows and the flow at outfall locations will exceed 5 cfs. When 5 cfs is exceeded, the Division of Water Quality recommends detention of the storm water to meet the minimum design standards of, 30 minute detention time for the 10 year 24 hour storm. In the following table both the 10 year and 100 year pond sizes are shown. South Jordan City has master planned all their ponds to handle the 100 yr. – 1 hour storm. The location of the ponds and the corresponding area of roadway they serve are shown in the following table:

<b>Outfall locations</b>	<b>Receiving Water</b>	<b>Segment of 11400 South the outfall is servicing</b>	<b>Design Storm / Pond Size / Outfall Rate</b>
Detention pond at 2700 West and 11400 South	11400 South storm drain (1300 West pond)	Bangerter Highway to 2700 West	100 yr. / 1.3 ac-ft / 15 cfs 10 yr. / 0.7 ac-ft / 15 cfs
Detention pond at 1300 West and 11500 South <i>South Jordan Master Plan</i> <i>South Jordan Master Plan</i>	Midas Creek	Redwood Road to 1300 West	100 yr / 1.42 ac-ft / 20 cfs 10 yr / 0.71 ac-ft / 20 cfs <i>100 yr. / 4.3 ac-ft / 1 cfs</i> <i>10 yr. / 2.7 ac-ft / 1 cfs</i>
Direct discharge to Midas Creek	Midas Creek	1300 West to 1200 West	<5 cfs
Detention Pond west of Jordan River at 11400 South	Jordan River	1200 West to 900 West (Jordan River)	100 yr. / 0.5 ac-ft / 1 cfs 10 yr. / 0.30 ac-ft / 1 cfs
Detention pond East of Jordan River at 11400 South	Jordan River	700 West to 900 West (Jordan River)	100 yr. / 0.5 ac-ft / 1 cfs 10 yr. / 0.25 ac-ft / 1 cfs
Direct Discharge West side of Willow Creek	Willow Creek	700 West to 600 West	<5 cfs
Detention Pond on the east side of Willow Creek	Willow Creek	I-15 to 600 West, also includes Jordan Gateway from 11000 south to 11800 South	100 yr. / 4.0 ac-ft / 35 cfs 10 yr. / 2.1 ac-ft / 35 cfs
Detention Pond on the east side of I-15	11400 South Storm Drain (Willow Creek pond)	200 East to I-15, also includes State Street from 11000 south to 11800 South, and 92 cfs from the East Jordan Canal	100 yr. / 8.2 ac-ft / 25 cfs 10 yr. / 7.7 ac-ft / 25 cfs

New storm drain lines will need to be installed within 11400 South from Bangerter to the East Jordan Canal. Any existing storm drains lines are very sporadic and are typically undersized.

### 12300 South / 12600 South

Currently along 12300 / 12600 South the roadway is being widened to 5 lanes. Detention ponds are being constructed along the corridor to manage the storm water developed from the five-lane

section, this will be used as the baseline condition. Alternatives that include improvement to 12300 / 12600 South all reflect a seven-lane section between Bangerter Highway and I-15. The section from I-15 to 700 East will remain 5 lanes and no adjustments to the storm drain system will be needed east of I-15. The roadway drainage developed between Bangerter Highway and the Jordan River is conveyed through a storm drain system and a series of detention ponds to reduce the peak discharge, the flows are eventually routed through an oil-water separator and discharged to the Jordan River. From I-15 to approximately 600 West storm water is conveyed through a storm drain system and an oil-water separator which outfalls to Willow Creek at 600 West. From 600 West to the Jordan River storm water is conveyed to and detained in a pond located on the east side of the Jordan River where it is discharged.

Widening the roadway to seven lanes increases the drainage area of the roadway by approximately 30% and subsequently the storm water will also increase by approximately 30%. It is possible that the existing storm drain system will adequately handle the increased flows, but a detailed analysis is needed to determine if capacity improvements are needed within the existing storm drain lines. For the purpose of this study it is assumed that the detention ponds have been constructed at a minimum size to accommodate the roadway drainage. The following summarizes the existing ponds that will need to be expanded to handle the addition flows generated from a seven-lane roadway.

- Pond at 3310 West and 12600 South– Covers the area from Bangerter Highway to 3300 West, the storm water outlets back into the storm drain system in 1200 South. Increase the pond capacity by 30%
- Pond at 2390 West and 12600 South – Covers the area from 3300 West to 2400 West and picks up the flow from the pond at 3310 West. The initial 15-cfs of flow is released into the Utah and Salt Lake Canal all remaining flow is released back in to the storm drain system. Increase the pond capacity by 30%
- Pond at 1585 West and 12600 South – Covers the area from 2400 West to 1600 West and picks up the flow released from the pond at 2390 West. Also picks up an additional flow of 11 cfs from the South Jordan Canal, pond outlets back into the storm drain system in 12600 South. Increase the pond capacity by 30%. All the flow released from this pond is ultimately discharged on the west side of the Jordan River on 12300 South.
- Pond on the east side of the Jordan River and 12300 South – Covers the area from Willow Creek (600 West) to the Jordan River. Increase pond capacity by 30%.

### **Jordan Gateway / Lone Peak Parkway**

The Jordan Gateway / Lone Peak Parkway runs in a north/south direction at about 600 West, it extends from 10600 South to 12300 South. The City limits between South Jordan and Draper occurs at 11400 South where the name of the roadway changes to Lone Peak Parkway in Draper City. The alternatives that include improvements to this section of roadway reflect expanding the current facility to a seven-lane section. As was stated in the 11400 south discussion, the area from 11000 South to 11800 South drains to 11400 South and is conveyed to the west to the proposed Willow Creek Detention basin.

Beginning at 10600 South, the Jordan Gateway between 10600 South 10800 South drains to 10600 South storm drain system and is discharged directly to the Jordan River for the 10 year peak flow this amounts to approximately 1.0 cfs of additional flow at the discharge point.

The section of roadway from 11000 South to approximately 10800 South is currently conveyed through a storm drain system to a detention pond that was constructed as part of the Sterling village apartment complex. The pond is located at approximately 11050 South and 750 West. The increase in storm water will amount to approximately 0.16 acre-ft of additional storage required within the Sterling village pond. The pond discharges to an abandoned irrigation ditch that runs several hundred yards to the Jordan River.

The section of roadway from 11800 South to 12300 South will also follow the current drainage patterns and storm drain system that are existing. The storm water is collected in an existing storm drain system and conveyed to a series of culverts and open ditches that begin at about 12250 South and Lone Peak Parkway. From 12250 South a storm drain culvert runs west and discharges to an open ditch which runs continues west for another 1500' before discharging directly into Willow Creek. A detailed analysis of the existing storm drain system will need to be performed to determine if the existing system has the capacity to handle the additional flows. The peak flows will increase by approximately 30%.

### **State Street**

The alternatives that include improvement to State Street all require State Street to be widened from a five-lane section to a seven-lane section between 11400 South and 12300 South. Again, these improvements will cause about a 30% increase in the peak discharge flows throughout the existing storm drain system. Currently a detention pond located at 12100 South on the west side of I-15 is being constructed as part of the 12300 South roadway project to specifically address the drainage from State Street. This pond is being constructed to handle the flows from State Street for a five lane section, the seven lane section will require the expansion of the pond to handle an additional 30% more capacity than is currently design for.

## Indirect Impacts to Water Quality 11400 South EIS

**Table A. Surface Water Flow Increase from Expected Commercial Development**

Alternative	Drainage	Alt 1	Alt 4	Alt 7
<b>Acreage increase from indirect commercial development</b>				
	Willow Creek	137	129	132
	Midas Creek	10	10	10
<b>Hourly Flow Increase (cfs) - using the Rational Method (Q=Cia)<sup>1</sup></b>				
	Willow Creek	45.2	42.6	43.6
	Midas Creek	3.3	3.3	3.3
<b>Daily Flow Increase (cfs)<sup>2</sup></b>				
	Willow Creek	3.77	3.55	3.63
	Midas Creek	0.28	0.28	0.28

cfs = cubic feet per second

<sup>1</sup>Rational Method: Flow (cfs) = C\*I\*a = runoff coefficient \* storm intensity (inches/sec) \* area (acres)

- Runoff coefficient for undeveloped land = 0.3, for paved surfaces = 0.9; For increase in runoff use 0.9 - 0.3 = 0.6

- Assume 10-yr 2-hr storm event. Intensity = 0.55 in/sec (South Jordan Master Plan, Intensity Duration Information)

<sup>2</sup>Daily flow increase = hourly flow increase \* 2 hour storm duration / 24 hrs/day

**Table B. Midas Creek Metal Concentrations for the TSM Alternative**

Alternative		Existing <sup>1</sup>	Added <sup>2</sup>	Anticipated <sup>3</sup>	Utah Water Quality Standard <sup>4</sup>
1, 4, and 7	Flow Rate, cfs	1.00	0.28	1.28	---
	Copper, mg/L	0.000	0.039	0.008	0.013
	Lead, mg/L	0.000	0.031	0.007	0.065
	Zinc, mg/L	0.000	0.181	0.039	0.120

<sup>1</sup>Existing 10-yr 7-day low flow rate in Midas Creek estimated by Bill Moelmer, UDWQ

pollutant concentrations downloaded from STORET.

<sup>2</sup>See Table A for flow rate calculations; metals concentration from Stormwater Quality Data Technical Report, Salt Lake County, UT Sept 2000.

<sup>3</sup>Anticipated concentration = [(Existing conc. \* Existing flow rate) + (Discharge conc. \* Added discharge flow rate)] / (Existing flow rate + Added discharge flow rate)

<sup>4</sup>R317-2-14, Table 2.14.2, one-hour average; standards for protection of aquatic wildlife is shown because they are more stringent than standards for secondary recreation and agriculture.

**Table C. Willow Creek Metal Concentrations**

Alternative	Parameters	Existing <sup>1</sup>	Added <sup>2</sup>	Anticipated <sup>3</sup>	Utah Water Quality Standard <sup>4</sup>
Alt 1	Flow Rate, cfs	3.00	3.77	6.77	---
	Copper, mg/L	0.000	0.039	0.022	0.013
	Lead, mg/L	0.000	0.031	0.017	0.065
	Zinc, mg/L	0.000	0.181	0.101	0.120
Alt 4	Flow Rate, cfs	3.00	3.55	6.55	---
	Copper, mg/L	0.000	0.039	0.021	0.013
	Lead, mg/L	0.000	0.031	0.017	0.065
	Zinc, mg/L	0.000	0.181	0.098	0.120
Alt 7	Flow Rate, cfs	3.00	3.63	6.63	---
	Copper, mg/L	0.000	0.039	0.021	0.013
	Lead, mg/L	0.000	0.031	0.017	0.065
	Zinc, mg/L	0.000	0.181	0.099	0.120

<sup>1</sup>Existing 10-yr 7-day low flow in Willow Creek estimated by William Moelmer, UDWQ

Pollutant concentrations assumed similar to the Jordan River, data downloaded from STORET.

<sup>2</sup>See Table A for flow rate calculations; metals concentration from Stormwater Quality Data Technical Report, Salt Lake County, UT Sept 2000.

<sup>3</sup>Anticipated concentration = [(Existing conc. \* Existing flow rate) + (Discharge conc. \* Added discharge flow rate)] / (Existing flow rate + Added discharge flow rate)

<sup>4</sup>R317-2-14, Table 2.14.2, one-hour average; standards for protection of aquatic wildlife is shown because they are more stringent than standards for secondary recreation and agriculture.